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Consequences of Mendelism on the Problems of In-breeding in Live-stock.*

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1. Systematism in Genealogical Investigations.

In a previous paper (Baashuus-Jessen 1924) I have called attention to a new method of measuring all possible degrees of in-breeding by a very simple numeric quantity which expresses, for any ancestor, the sum total of the so-called removes.

In the present article, I shall attempt to supplement the above and previous articles on this subject, particularly as regards the closest possible degree of in-breeding, and also so demonstrate the applicability of the method in the definitions of grading and admixture of alien blood.

Ancestral Tables.

It would be of great advantage in comparative genealogical researches, if generally accepted methods could be agreed upon. Among various types of ancestral tables, that shown in table 4 undoubtedly gives the best survey and is adopted by most writers, but high cost of printing usually curtails the inclusion of many such tables in a paper. If, therefore, it could be agreed that the sectors of the table are always numbered in serial from right to left, and from the first generation to the following ones, as already practised by various authors, it would easily be possible, in future publications, to demonstrate various forms of in-breeding without resorting to these inconvenient ancestral tables. If, for instance, an ancestor is designated as No. 7 and No. 23, his position is clearly defined, see Prince Albert in table 4.

It is now common practice that males are placed on the right of females in ancestral tables. In zootechnical terminology the ancestors Nos. 1, 3, 7, 15, 31, etc. form the male line, while the ancestors Nos. 2, 6, 14, 30, 62, etc., constitute the female strain, or the direct maternal line. In a complete table, the individual on the left of the most remote generation is the first ancestress, or foundation female, after whom the female descendants are often named. A glance at table 4 clearly demonstrates, however, that a distant foundation cow as, for instance, Adina (see ancestor No. 62 in table 4), can be of little, if any, genetic importance in comparison with the other 61 ancestors in the table of the bull Aron Krüger. On the other hand, several appearances of one and the same ancestor in recent and remote generations are unquestionably of great importance, and the *repeated* appearance of the same ancestor is the chief thing in notions of in-breeding and line-breeding.

In-Breeding and Out-Breeding.

By means of table 1† the degree of in-breeding in any pedigree can be determined by a simple calculation,

TABLE 1.

Remove or Generation	Total Number of Ancestors in each Remove	Ancestors	Value of each Ancestor	
			by Fraction	by Percentage
I.....	2	Parents	$\frac{1}{2}$	50
II.....	4	Grand Parents	$\frac{1}{4}$	25
III.....	8	G. G. Parents	$\frac{1}{8}$	12,5
IV.....	16	and so on	$\frac{1}{16}$	6,25
V.....	32	—	$\frac{1}{32}$	3,125
VI.....	64	—	$\frac{1}{64}$	1,5625
VII.....	128	—	$\frac{1}{128}$	0,78125
VIII.....	256	—	$\frac{1}{256}$	0,390625
IX.....	512	—	$\frac{1}{512}$	0,1953125
X.....	1024	—	$\frac{1}{1024}$	0,09765625
XI.....	2048	—	$\frac{1}{2048}$	0,048828125
XII.....	4096	—	$\frac{1}{4906}$	0,0244140625

no matter how complex are the connections of blood-relationship. On the left side of the table the removes are indicated by Roman figures right back to the twelfth parental generation. On the right side, the values of ancestors found in any of these removes are shown, both by fractions and by percentages. The sum total of the values represented by the same ancestor in different generations gives an expression of the degree of blood accumulation. It will be seen that this method of calculation is a very simple one as compared with those proposed by Pearl and Sewal Wright (1922). From a glance at an ancestral table, even a mental-calculation can in many cases be carried out. Pearl's method does not express any accumulation of blood (see below) and, in my opinion, Sewall Wright's method is based on false premises, see section II. of this article. I am unable to understand that their methods of calculation have any real bearing upon the problem of in-breeding in its strictly genetic sense, nor on systematism in genealogy.

No method of calculation hitherto proposed is of any use for the investigation of certain characters, for instance, grey colour in horses, because this character, being dependent on a factor dominant to other colour factors, may be traced continuously along a definite line of succession in the ancestral table, frequently through innumerable generations. Also unfixable characteristics, such as roan colour in heterozygous shorthorns, have no bearing upon

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†This and the tables Nos. 2 and 3 are modified reprints of tables published in *Norsk Veterinaertidsskrift* No. 3, 1921.

in-breeding. KRONACHER (1923) says: "The view of an arbitrary possibility of mixing characteristics generally, expressed by the terms ½, ⅞ths, ⅞ths, blood, etc., will have to be rejected." It is evident that such gradation cannot be employed with regard to simple characters such as those above mentioned where the genetic constitution is clearly defined and known. But I believe that, in spite of KRONACHER'S opinion, calculating methods are still justified and of real value to breeders mating their animals with a view to attain homozygosity in the transmission of *a whole series of qualities* such as good points of general conformation, height, weight, speed, beefiness, chest depth and milk yield. These qualities are presumably determined by multiple (homomeric) factors, and their genetic constitution is practically unknown. CASTLE'S experiments in guinea pigs and those of PUNNETT and BAILEY (1914) in poultry show that they have succeeded in isolating definite genotypes where dominant and recessive unit factors are present in the most varied combinations. From this we may infer that the live stock breeds have been moulded through isolation of distinct genotypical combinations of factor-complexes, each differing from the others. From crossing two, or more, breeds of mixed origin, and from subsequent in-breeding, new breeds can be derived. More frequently, however, the variability among the off-spring is too pronounced and the individuals are not uniform enough for marketing purposes nor will they breed even comparatively true to type. It has long been known that in such cases, through so-called grading, good results as regards genotypical and phenotypical constancy in a whole series of qualities can easily be obtained. This clearly indicates that accumulation of certain multiple factor complexes in live stock are of paramount importance. By means of grading, the factors of the superior breed are successively accumulated while the factors of the primitive population, practically speaking, are eliminated.

Since in typical genealogical researches we cannot, of course, demonstrate any segregation of factors, but only deal with sectors (removes) of the ancestral tables, I have in this article, failing a better expression, ventured to adopt the generic term "blood," time-honoured in zoo-technical researches, for the purpose of designating accumulation of a certain factor complex. In the terminology of genetics, this term which, in most cases, no doubt, is synonymous with the notion of a certain complex of factors (see above) does not occur. In my opinion, a concentration, or accumulation, of the same blood, means homozygosis for a comparatively great number of those factors which in an individual produces a certain type, a certain genotypical constitution, wherein a whole series of characteristics is included. According to long experience, this accumulation of blood, *i.e.*, a certain group of factors, is the very gist and one of the chief problems in live stock breeding. In the proper meaning of the word, according to my notion, in-breeding, as a means of fixing a certain type, must be defined as a summation, or accumulation, of a certain group of multiple factors segregated or inherited along different lines of ancestry from a common prepotent ancestor. As shown below, the difference between in-breeding and line-breeding is a matter of degree rather than of kind. Within all breeds, genealogical researches will, in my opinion, show that line-breeding (see table 2) always is a concomitant of what is termed pure-breeding. The breeders, whether aiming at pure-breeding or at grading, want nothing more than an accumulation of the homozygous condition of the factor complex of the best individual endowed with prepotency, no matter how this is genetically determined.

Since, therefore, as stated above in connection with grading, such accumulation of a certain factor complex is attainable, it evidently must be a decided advantage to a good individual that it possesses a strong accumulation, as expressed in per cent. of a common (*i.e.* repeatedly appearing) ancestor whose potency indicates that it was a homozygote in a certain factor complex as, for instance, in *AABBccDD*. For these reasons my method of calculation must be said to be well founded, because it furnishes an expression of the degree of the assumed accumulation of factors. In the above factor complex we have four factor pairs. Now, let us assume that the breed chosen for the purpose of grading deviates from the inferior breed by 20 allelomorphs, and that a prepotent common ancestor deviates from the other individuals of the same breed by 10 allelomorphs. On this assumption it is evident that an accumulation of a certain factor complex is easier to achieve by a strong concentration than by a slight one, and that in the work for improvement the accumulation of blood must be the chief task, even if it is only approximately possible to form an idea of the degree of achieved homozygosis in a factor complex of an individual. Even with this limitation, the per cent. concentration in an ancestral table will in many cases be sufficient to act as a good guide for a critically disposed breeder in judging the breeding value of an animal, which is nearly perfect as regards points or capacities. It is not without reason that in all countries the breeders, in mating pure-bred animals, have attached great importance to the accumulation of the blood of a certain ancestor in the offspring. Hereby, of course, breeders of a critical disposition duly consider the qualities of the ancestors, which they frequently know from their own observations for several generations back or can trace in stud and herd-books of modern type. Pedigrees, however, must be studied with a good deal of critical judgment and are only to be regarded as an aid in selection.

From the presence of a definite degree of in-breeding in an individual it is evidently impossible to come to any conclusions as to whether the combination of multiple factors, determining a certain type, is in a state of corresponding homozygous balance. None of the various methods of calculation, as adopted by students of pedigrees, is capable of telling anything as to whether some few of the multiple factors are present or not which, according to the assumption, should be displayed through a greater or smaller deviation from the type of the variant whose genetic constitution is known. A keen testing of the animal and its offspring should guide the breeder in the study of this matter, and in spite of the imperfection of all methods there is every reason to believe that, generally a strong accumulation of a prepotent ancestor in the pedigree of an individual is synonymous with a strong accumulation of its multiple factor complex.

When to draw the line between in-breeding and line-breeding, both of which represent degrees of one and the same thing is, systematically at least, fixed by means of the following standard, owing to the fact that the sum total of blood is expressed in only one numerical figure. I would, therefore, suggest the classification made in table 2.

TABLE 2.

Sum total of at least two ancestors, from and including 75 per cent. toward 100 per cent. = close form of in-breeding.

Sum total of at least two ancestors, from and including 50 per cent. toward 75 per cent. = mild form of in-breeding.

Sum total of at least two ancestors, from and including 25 per cent. toward 50 per cent. = close form of line-breeding.

Sum total of at least two ancestors, from and including 1 per cent. toward 25 per cent. = mild form of line-breeding.

The same method has been adopted in table 3, in which the various degrees of the most frequently occurring types of in-breeding and line-breeding are demonstrated.

In table 3, the cases eight to 13 represent the back-cross, provided the parental individual is endowed with prepotency (*i.e.*, a homozygote). According to WRIGHT (1923), BATES is said to have produced some of his shorthorns by means of the cases 11 and 12. These, undoubtedly, are cases which, in the genetic sense, come nearest to the notion of pure lines. In my opinion, degrees of in-breeding so close that the homozygous state in a comparatively great multiple factor complex becomes almost as stable as in the pure lines, can approximately be reached in experiments within a strain belonging to one owner only. But no such fixation can be achieved in a whole breed, because here a tendency toward out-crossing is always present (see BAASHUUS-JESSEN 1924, pp. 234 and 239). If such out-crossing did not make itself felt, the state where no further improvement was possible would soon be reached because of the homozygosis attained through in-breeding of that particular breed. In live stock breeding, however, there is hardly any chance of this occurring, because even old breeds like the shorthorns, which have been closely in-bred, are still flexible enough to admit of continued selection in various directions.

In table 3, the cases of in-breeding Nos. 1, 2, 5 and 7 to 13 are simple, being based upon only one common ancestor, whereas cases 3, 4 and 6, all based upon more than one ancestor, are more complex.

TUFF (1923) maintains that "line-breeding" is a method of breeding which can be characterised by the fact that the parents of the line-bred individual possesses one or more common ancestors in an ancestral table of four generations. Expressed in per cent., this means that, as a minimum, the total of the accumulation must amount to $12,_5$ per cent. I do not agree with him in thinking that line-breeding must have taken place within the generations I. to IV., and I am of the opinion that the limiting minimum must be put at a still lower figure. The question of how much the limit should be lowered cannot be answered accurately.

In breeds of horses with colours such as bay, brown and chestnut predominating, the transmission of grey colour can easily be traced in the ancestral tables. Grey thoroughbreds as, for instance, The Tetrarch, the Derby winner, prove, I believe, the correctness of my statement regarding transmission of this colour. As a consequence of grey colour being dependent on a completely dominant factor, either the sire or the dam of a grey horse

TABLE 3.

Different Matings	No. of common Ancestors	Percentage of In-breeding in the Offspring			
1. An individual ×its half second cousin	1	$6,_{25}$	+ $6,_{25}$	=$12,_5$	Accumulation types
2. An individual ×its half first cousin ...	1	$12,_5$	+$12,_5$	=25	
3. An individual ×its first cousin ...	2	$12,_5$	+$12,_5$	=25	
4. An individual ×its double first cousin ...	4	$12,_5$	+$12,_5$	=25	
5. An individual ×its half-brother or half sister ...	1	25,	+25	=50	
6. An individual × its brother or sister ...	2	25	+25	=50	
7. An individual × its grandchild ...	1	50	+$12,_5$	=$62,_5$	
8. An individual ×its child(two top-crosses)	1	50	+25	=75	Back-cross or Grading types
9. An individual ×its offspring from case 8 (three top-crosses) ...	1	75	+$12,_5$	=$87,_5$	
10. An individual ×its offspring from case 9 (four top-crosses) ...	1	$87,_5$	+ $6,_{25}$	=$93,_{75}$	
11. An individual ×its offspring from case 10 (five top-crosses) ...	1	$93,_{75}$	+$3,_{125}$	=$96,_{875}$	
12. An individual ×its offspring from case 11 (six top-crosses) ...	1	$96,_{875}$	+$1,_{5625}$	=$98,_{4375}$	
13. An individual ×its offspring from case 12 (seven top-crosses) ...	1	$98,_{4375}$	+$0,_{78125}$	=$99,_{21875}$	

must in every case possess the same colour, a fact discovered by WALTHER (1912) and corroborated (1913) by the present writer. In a particle of a chromosome, therefore, this grey colour occurring in a single individual of a most remote generation is transmitted to a whole succession of descendants. Hence we may infer that a prepotent ancestor is able to exert influence on his descendants, not only if the prepotent ancestor appears within the generations I. to IV., as TUFF claims, but also, as in the above-mentioned case, when he appears in generations beyond IV.

If in the moulding of strains or breeds a definite principle of selection has been adopted, one must assume that the pure-bred ancestors in the generations I. to VII., for instance, possessed many of the desired qualities which are determined by a factor complex inherited from the common progenitor in generation VII. For, of course, the factors transmitted from this ancestor cannot, according to WEISMANN, be supposed to have become old and worn out on their passage through his descendants. If the ancestors intervening between the parents and the progenitor, on which the in-breeding is carried out, had not been individuals possessing good qualities, it is to be supposed that able breeders would not have used them for breeding purposes. I therefore believe that a remote, but strong accumulation in the generations behind IV. is of greater importance than, for instance, the following degree :—$\frac{1}{16} + \frac{1}{16} = 2,_5$ per cent. An ancestral table, according to HANSSON and NANNESON (1916), has been shown for the Swedish Ayrshire bull Aron Krüger of the Skarhult stock. If the minimum limit is drawn according to TUFF, the percentage of in-breeding in regard to the progenitor Ayr would be exactly $12,_5$, whereas, if, according to my method of calculation, all appearances of Ayr back to and inclusive of generation VI. is considered, the sum total percentage would be $53,_{125}$. Of this amount, $32,_{5875}$ per cent. is due to remote back-crosses. Therefore, the requirement that the in-breeding shall have taken place within the fourth generation, as advanced by TUFF, can hardly be upheld.

A comparison of the best individuals of different breeds for the purpose of ascertaining which of the latter possesses the strongest accumulation in regard to a very remote ancestor is of great interest since it throws light on the problem of the range of variation. In this connection I would call attention to the calculations which I have shown in a previous paper (BAASHUUS-JESSEN 1924, pp. 232 and 234) regarding some horses of the Kladrub and Morgan breeds. In my opinion, high degree of remote in-breeding, supported by natural or artificial selection in a certain direction, is the most decisive agent in the fixing of the so-called breed character, or type. In this respect the shorthorns are probably the most characteristic example existing although, according to an investigation I have made, the statement to be found in the *Live Stock Journal*, 1924, p. 108, to the effect that in the pedigree of a heifer the ancestor, Champion of England, occurs 1026 times, probably is a mistake.

In the Norwegian Gudbrandsdal breed of horses, individuals raised away from their proper home frequently vary much as to type. In such cases the percentages of in-breeding are very low, and of different degrees, and the in-breeding is based upon several ancestors, each of a different line. As an example, I may quote the stallion

TABLE 4.

Aron Krüger, Swedish Ayrshire bull from Skarhult																															
2 Adina 14487																1 ■ Brunn Krüger 2326															
6 Adina								5 ■ Brunn Krüger								4 Blenda								3 □ Krüger							
14 Adina				13 King				12 Blenda				11 □ Krüger				10 Blenda				9 ◡ Ayr 2				8 Olga				7 △ Prince Albert			
30 Adina		29 ◗ Ayr 2		28 Queen Victoria 1		27 ◗ Ayr 2		26 Blenda		25 ◗ Ayr 2		24 Olga		23 ▽ Prince Albert		22 Foundation cow		21 ● Ayr		20 Venus		19 ● Ayr		18 Olga		17 ◗ Ayr 2		16 Queen Victoria		15 ◗ Ayr	
62 Adina by ● Ayr	61 ◗ Ayr 2 by ● Ayr	60 Venus by ● Ayr	59 ● Ayr	58 Queen Victoria	57 Bull in Scotland	56 Venus by ● Ayr	55 ● Ayr	54 Foundation cow	53 ● Ayr	52 Venus by ● Ayr	51 ● Ayr	50 Olga by ● Ayr	49 ◗ Ayr 2 by ● Ayr	48 Queen Victoria	47 ◗ Ayr 2 by ● Ayr	46	45	44	43	42	41 ● Ayr	40	39	38 Olga	37 ● Ayr	36 Venus by ● Ayr	35 ● Ayr	34 Cow from Scotland	33 Victor of Munnoch	32 Venus by ● Ayr	31 ● Ayr

Skarphedin 1039, who has three distinct ancestors of the respective percentages: $15,_{625}$; $12,_{5}$; and $12,_{5}$. In this case the line-breeding appears to be the result of a fact frequently found in live stock breeding, viz., that all individuals in a breed descend from only a few progenitors (BAASHUUS-JESSEN 1924, p. 232). In many breeds of horses, according to DE CHAPEAUROUGE (1909), line-breeding (*i.e.* degrees below 50 per cent., see table 3) is the most commonly adopted method of breeding. To my mind, line-breeding is the least dangerous method of breeding, but hardly the method from which the greatest progress will result. At any rate, it undoubtedly entails a very wide range of variation. There is some sound reasoning behind the old proverb that casualties nowhere play such a prominent part as in horse breeding.

I have chosen the ancestral table of Aron Krüger, only because it is particularly well suited for a general demonstration of the types of close in-breeding. The accumulation of the distant ancestor Ayr is due to the exceeding of the 50 per cent. limit suggested for line-breeding, the total here being $53,_{125}$. In a pedigree there are, of course, as many males as females, and in generation V., for instance, there are 16 of each. The reasons for the above-mentioned overstepping are to be found in the remote back-crosses already dealt with, appearing in a number of six in all. In the fixing of the shorthorns, however, a still greater accumulation can be shown. From DE CHAPEAUROUGE may be quoted that the shorthorn bull Belvidere, once belonging to BATES, the famous English breeder, was in-bred on the progenitor Favourite, to the extent of $\frac{6}{16} + \frac{8}{32} + \frac{4}{64} = 68,_{75}$ per cent., and that the cow Restless was in-bred on the same progenitor to the extent of $\frac{2}{8} + \frac{6}{16} + \frac{3}{32} + \frac{1}{64} + \frac{1}{256} = 73,_{828125}$ per cent.

From a theoretical and genealogical point of view, we may say that the numeric quantity which remains upon deduction of the percentage of in-breeding from 100 represents the degree of out-breeding. For the following reason this expression need not be synonymous with outcrossing, which term in live-stock breeding as well as in the genetic sense stands for a comparatively great disagreement in outward appearance between the animals mated *inter se*. When the same principle of selection has been applied for a longer time within a breed, the representatives of different lines will frequently exhibit identical qualities to some extent, from which we may infer that at least some of the factors are the same indifferent strains.

The number of ancestors is reduced as a consequence of in-breeding. In calculating the degree of in-breeding this reduction is of no great importance. As shown by Mendelism, the same value, or importance, can hardly be attached to a remote ancestor as to a recent one. On the supposition that the common ancestor is endowed with prepotency, males coming from a back-cross of 75 per cent. in the generations I. and II. are evidently better qualified for fixing a type in a herd than are males coming from a single back-cross of $18,_{75}$ per cent. in the generations III. and IV. The significance of remote back-crosses presumably increases proportionately to their number, and the accumulation of blood becomes of course greater still if, simultaneously with the remote back-cross, still more appearances of the same progenitor occur in other sectors of the ancestral table, see pedigree of Aron Krüger.

The strength of the method of calculation here proposed is particularly found in the fact that it gives an expression of the amount the progenitor contributes to the accumulation, this being greater the closer the progenitor is related to the in-bred offspring. If in the pedigree there is a strong accumulation of a remote ancestor, this also finds its due expression on account of the blood being summed up. Evidently, the main task is a calculation that introduces different values of the ancestor in question according to whether he (or she) appears in remote or recent generations. The purpose of the calculation of the degrees of in-breeding is not to ascertain the loss of ancestors (in German, Ahnenverlust), *i.e.*, the difference between the greatest possible number of ancestors within a certain number of generations and the actual number as reduced by the in-breeding process. On the contrary, the purpose is to determine the probable accumulation, in a descendant, of the factor complex of a prepotent ancestor.

Grading.

From a genetical point of view, there can be no difference between back-cross-in-breeding and grading, provided, as a theoretical supposition, that in both cases breeding is carried on from individuals with identical genetic constitution within a pure-bred strain and a population of mixed origin, respectively.

In-breeding may be characterised as an accumulation, in an individual, of the *factor complex of an ancestor*, and grading may be characterised as an accumulation, in the animal bred according to this method, of the typical *factor constitution of a breed*. Thus, there are certain points of resemblance between these methods of breeding. A difference, on the other hand, is to be found in the fact that the range of variation is usually greater in the progeny of animals bred according to the grading method than in the offspring from parents of a pure breed in which close in-breeding has been practised. When grading has been carried on for a sufficient length of time, the offspring must of necessity also become line-bred in respect of common ancestors of that breed with which the crossing was made. Certain breeds as, for instance, the wild English park cattle, shorthorns, Hereford cattle and the red and white Swedish cattle have the reputation of rapidly transforming, through grading, a stock lacking in breed character, or type, into a more uniform one. It is probable that, apart from dominance this prepotency is due just to the influence of ancient in-breeding practised in these breeds.

As a measure of the degree of grading, my method of calculation can be adopted to advantage. The pedigree rules of several breeds stipulate that, in order to be qualified for entry into the stud or herd-book, the individual must be graded up with four top crosses, *i.e.*, that sire, sire of dam, sire of granddam, and sire of granddam's dam. (See table 4, ancestors in the series Nos. 1, 5, 13 and 29; see also table 3, case 10). In all, $\frac{15}{16}$, or $93,_{75}$ per cent. of the blood must be from one breed, only $\frac{1}{16}$, or $6,_{25}$ per cent. of the blood from another, or unknown, breed being tolerated. In case one, or more, of the above male ancestors are themselves graded-up animals, the difficulty arising heretofore, from the lack of a terminology for the admixture of alien blood, is easily overcome by the adoption

of my percentage method. In complicated genealogical researches, where other methods present the case but indistinctly, the above method can be applied with ease and with precision as to the result. Thus, $\frac{1}{16}$ admixture of foreign blood is the same as $\frac{2}{32}$, or $\frac{4}{64}$, etc.; the sum total in all cases being $6_{,25}$ per cent., see table 1.

Admixture of Alien Blood.

In the ancestry of two of the great progenitors of the Norwegian Gudbrandsdal breed of horses there appears a thoroughbred stallion, Odin (by Partisan out of Rachel) exported from England in 1834. The Gudbrandsdal breed may now be described as a smaller draught horse of cold-blood (occidental) type. From time to time, however, individuals with some character of hot-blood and trotting gift emerge as, for instance, the stallion Skarphedin, born 1910. In order to throw light upon the admixture of foreign blood, I calculated the appearances of Odin in the pedigree of Skarphedin back to generation XII., by means of table 1. Odin appears 17 times in all, and his percentage is $\frac{1}{2^{13}} + \frac{4}{2^{12}} + \frac{5}{2^{11}} + \frac{4}{2^{10}} + \frac{6}{2^{9}} = 1,_{7}$ per cent. If qualities such as hot-blood and trotting gift are controlled by recessive factors, as I believe, then a calculation such as the above will in some cases undoubtedly prove of interest.

II. The Closest Possible Form of In-Breeding in Animals.

Aristotle says that stallions mate with their dams and daughters, and that a stud-farm reaches perfection, only when the stallions are mated with their own descendants. (Acc. to Pusch and Weber 1912).

Most breeds have undoubtedly been developed from in-bred individuals of populations of mixed origin. In-breeding, as a rule, has transmitted a certain factor complex governing qualities of additional economical value, from one individual to several animals in the owner's stud, herd or flock. Live stock history demonstrates that breeds first originate as new strains, usually only within one, or few, in-bred herds. Whereupon, the males of such a new strain transmit their factor complex to the neighbouring herds by mating with females of those herds, the strain character being hereby worked up through grading. In other cases, females of the new strain, served by males of that strain, are sold whereby a certain factor complex is spread through pure-breeding and is transmitted in a safer way than through grading. Since a breed may be moulded through pure-breeding, or inter-breeding in some cases, and through grading in other cases, generally many female strains in proportion to but few male lines arise in the breed, see table 4, the different lines being characterised, as a rule, through small deviations from the common type of the breed. In this way the strain spreads and soon comprises the larger part of a parish or a still larger district. It is from the very first beginning always a good reputation that causes the propagation of a breed, or strain, outside its own neighbourhood. What is sold and bought is in reality a certain factor complex which the breeders isolate through avoiding crossings between in-bred animals of their new strain and animals belonging to other strains. That, at an early stage, breeders have raised the claim of closed registers, which always, practically speaking, entails a slight line-breeding of the future animals of the breed in question; further, that able breeders in selecting their breeding animals have attributed decisive importance to conservation of the breed character, to the accumulation of blood from a certain ancestor, shows the great significance of isolation in the in-breeding problem. Indeed, "splendid isolation" is an expression that is very characteristic of the effect of systematically practised in-breeding.

Sewall Wright asserts regarding brother and sister matings in successive generations:

(*a*) That this method leads to homozygosity, automatically and more rapidly than any other method of in-breeding.*

(*b*) That a heterozygous population by means of this method can be split up into various homozygous lines.

(*c*) That by this method inferior types, usually determined by a recessive complex of factors, will be sorted out, while superior individuals, which have stood this acid test, should prove a suitable material for the breeders.

Tuff maintains that Wright's method of calculation of the degrees of in-breeding is probably the most correct because it is founded on experiments and calculations made to decide which system of breeding leads most rapidly toward homozygosity.

If, now, Wright's premises are incorrect, our views of the nature of in-breeding, and of its systematism, have to be changed. Commenting on the co-efficient of in-breeding proposed by himself, Wright says (1922) that an individual produced by continued brother and sister matings in three generations has a co-efficient of 50 per cent. and that, on the other hand, an individual produced by continued parent-offspring mating in three generations (see type 9 of table 3 in the present article) has a co-efficient of only $43,_{8}$. If that which I have termed back-cross-in-breedings be recognised as the closest form of in-breeding, the latter percentage is evidently a fallacious one. In a previous paper (Baashuus-Jessen 1924, pp. 231 to 240) I have disputed his theory, and I maintain that back-cross mating is the closest possible form of in-breeding. Below, I present further evidence corroborating this statement.

If in several successive generations, certain types of brothers and sisters, each of identical genealogical value as, for instance, the groups 1 to 9 of table 3, be mated *inter se*, then, a calculation by my method of the degree of in-breeding will give the following result. The accumulation of blood from a common ancestor will not be increased in any of the litters, but will remain constant, no matter how often the mating of brothers and sisters *inter se* is repeated. One or more back-crosses to an ancestor are required to increase the percentage of blood, and, in my opinion, one or more back-crosses to a prepotent male descendant of the common ancestor are required to create uniformity in such a litter. The prospect, however, of the segregating out of an individual, homozygous in respect of a series of qualities, would appear to be greater by mating *inter se* brothers and sisters of type 9 than of type 1.

*See Wright 1922, Bulletin, 1121, p. 47. On this matter, Wright has contradicted himself, I think. He says (1920): A type is fixed most rapidly when matings are made between selected brothers and sisters; and in the same essay, p. 39 he also says: Speaking generally, the continued use of a sire of proved prepotency is the most rapid method of fixing his type.

If any kind of mating *inter se* of brothers and sisters is at all appropriate in live stock breeding, it appears to be logical that the in-breeding types Nos. 3, 4 and 6 of table 3 must be the least profitable, because they are based on more than one ancestor, whereas types Nos. 5, 7, 8 and 9, being based on one ancestor only, must be more suitable for the purpose. In a previous paper (BAASHUUS-JESSEN 1924) I have called attention to the fact that brothers and sisters frequently vary in type and that their prepotency is indicative of distinctive factor complexes carried in each of several brothers and sisters. The inference, therefore, to be drawn from this must be that, from a strictly genetical point of view, mating of brothers and sisters *inter se* entails cross-segregation instead of consolidation, the latter being what breeders are aiming at in practising in-breeding. Uniformity, not variation, is what one wants to obtain by *in-breeding*. Variation, on the other hand, is obtained through *out-breeding and out-crossing* with other lines of ancestry or with an individual of another breed respectively. If this statement of the main principles is not accepted as correct, it will be difficult ever to systematise in-breeding.

In my opinion, what makes the problem of in-breeding so difficult are the complex types of in-breeding based upon several ancestors, each of different ancestry and, probably also, each representing different genotypes. We call this in-breeding (see statement regarding Skarphedin 1039), but in reality I think it is a form of out-breeding or out-crossing. This is well worth considering. The difficulty is that we are unable to determine whether a quality has segregated as a consequence of in-breeding or of a remote out-cross. From the notion of in-breeding, the types Nos. 3, 4 and 6 of table 3 ought to be excluded because they represent a dilution, not a concentration. No greater biological importance can be attached to mating brother and sister than to mating half brother and sister. The problems of in-breeding and out-breeding will become much simplified if this line of thought be accepted. In man, mating of parent and child, or brother and sister *inter se* has, for religious and ethical reasons, been called incest. Ethics, however, never existed among the pioneers in live stock breeding, as regards their animals, their chief aim being to fix distinguished types, and this, no doubt, will still in the future remain the principal object of in-breeding.

The experiments carried out by PUNNETT and BAILEY throw a good light on these problems. In my opinion, an individual which is a typical F_1 in genetic respects, can never form the starting point in in-breeding. As such, a homozygous (prepotent) individual of the F_2-generation is always necessary. Let us assume that in PUNNETT and BAILEY'S experiments large Goldpencilled Hamburger and small Sebright Bantam represent two multiple factor complexes, both created through in-breeding, but being different. The offspring from these (the F_1-generation) is, then, a result of an out-crossing. The two new types, segregating in F_2, the one being larger than Hamburger and the other smaller than the Bantams, are the result of a re-combination following the preceding out-crossing, and both types represent improvement, if heavy weight, or light weight respectively, is the quality wanted for selection. The factor complexes on which the two new types are based can, of course, be preserved and fixed through in-breeding only. On a new crossing it is highly probable that the homozygous factor complex of these new types would immediately become disturbed and be brought out of the factor-equilibrium which determines their type. The starting point in every improvement by means of in-breeding must always be the best animal in respect of points, physiological or mental capacities, the individual in addition being endowed with prepotency. In live stock breeding, as a rule, such an individual will be representative of an entirely *new* type which, in genetic respects, corresponds to a homozygous individual of the F_2-generation. I believe that only a factor complex which determines a newly formed homozygous type in the F_2, or one of the successive filial generations, can form a starting point of in-breeding in its strict sense. In zootechnical respect, on the contrary, mating of two homozygous, but genotypically different, P_1 individuals, of two heterozygous F_1 individuals, cannot constitute any form of in-breeding. While some authors, as for instance, WRIGHT, consider *segregation of different types* from the F_1-generation to be in-breeding, I am inclined to believe that this view is an erroneous one, and essentially incompatible with the notion of in-breeding in the zootechnical sense.

According to DE CHAPEAUROUGE (1912), COLLING, when founding at the end of the 18th century his famous shorthorn strain, acquired beefy breeding animals of a certain type. There is, however, no trace of evidence that he acquired individuals of extremely different types as, for instance, dairy cattle and beef cattle, and that in the following F_2-generation he came into possession of an assortment of many distinct types, from which he chose the most ideal one. From this classical case we may infer that continued mating of brothers and sisters from a heterozygous population, whereby extremities of different types are segregated, has had no bearing upon the notion of in-breeding in its zootechnical sense. The fact that mating of brothers and sisters has been put to the fore in the discussion on the problem of in-breeding has caused much of the prevailing confusion of ideas, I believe. The following statement from *Live Stock Journal*, August 1st, 1924, concerning the Cattle Breeders' Conference, Edinburgh, 1924 refers to continued mating of brothers and sisters for an indefinite period, and shows well, I think, the breeders' opinion in this matter: All that can be said in answer to that is that it is to be hoped that no modern breeder will be so foolish as to try it on with a high-class herd.

In-breeding can only be back-cross-in-breeding by means of a homozygote, or accumulation of a certain factor complex, inherited from a homozygous individual through several of its descendants. These may certainly be heterozygotes in multiple factor complexes determining some of a whole series of qualities but less so, however, than what is generally considered to be a typical F_1 individual. In spite of the circumstance that in genetic respect there can be no difference between grading and back-cross-in-breeding, still, in practical live stock breeding there is a great difference between these two methods. *Grading* is always carried out by means of a homozygous individual whose factor complex has been

transmitted to many other individuals of the same breed, while *back-cross-in-breeding* must be practised by means of a new-formed factor complex occurring in a particularly prominent individual, who suddenly emerges within a strain. To practise grading is, of course, easier than to make use of back-cross-in-breeding. The latter method has been employed particularly by old English breeders.

From photographs shown on plates I. to IV. accompanying SEWALL WRIGHT's essay (1922, Bulletin 1090) it is evident that in the litter of guinea pigs which was in-bred through continued brother and sister matings extending over 12 to 19 generations there still exists a very great variation in the patterns of colour. On plate IV. a pair of guinea pigs and their parents, grand parents and great grand parents are shown. From this and also from the other photographs it appears, in my opinion, that uniformity which should have been a result of homozygosis, as automatically attained through the practised in-breeding, does not exist. WRIGHT says that there is little, if any, genetic variation left in this stock. The variation in pattern which exists seems to be due to non-transmissible irregularities in development . . . Note the large amount of nongenetic variation in amount of white. His line of argumentation appears to me so vague in the above-mentioned case that there is every reason to dispute his assertion of continued brother and sister matings autonatically leading to homozygosis. If characteristics such as colour and white markings are not determined by certain factor complexes, evidently analysis of any characteristics, and subsequent critical test of them, will be rendered impossible. FUNKQUIST and BOMAN (1923), amongst others, are inclined to take the view that white markings in cattle are genetically determined. They admit, however, that it is difficult to fix some of them. Also FRANCIS PITT thinks that the white markings in the Hereford cattle are determined by certain unit factors. The guinea pigs shown in WRIGHT's photos vary greatly, not alone as regards placing and extent of the white markings, but also as regards intensity and number of the dark colours. On plate I., the male is three coloured, whereas his sister is only two coloured. The fact that the individual No. 1 from left on plate IV. has, practically speaking, the same white facial marking as his great grandchild, viz. No. 2 from right, would indicate that the variation may be genetically determined. The above quotations from WRIGHT must, I think, be considered as an admission that no homozygosis as regards colour, a quality easily to be tested, has been attained through continued brother and sister matings, which ought to have been proved.

Breeders do not wish for several good homozygous types in a breed, as WRIGHT thinks, but only for one, viz. that one embodying the ideal type of the breed, which aims at satisfying some practical requirement. The above example, taken from PUNNETT and BAILEY's investigations, also throws light on this question. It is evident that within the same breed far-seeing breeders want either the large type or the small. We may safely conclude that they do not want both, because then the range of variation in a breed would become too great.

I further doubt whether through in-breeding it is possible to sort out the inferior individuals of a herd and to retain the good ones. Most breeders are likely to object to such an experiment because the economic result would undoubtedly prove discouraging. It is hard to believe that old English breeders such as BAKEWELL, COLLING and BATES, or the Swedish breeders later on, succeeded in sorting out so many absolutely inferior animals. If we assume that the segregations of inferior animals amounted to 25 per cent. of all births at the beginning of their breeding experiments, it must have made these men hesitate to continue the use of in-breeding as a method of improvement. The aim of in-breeding and line-breeding appears to me to consist only in fixing desirable qualities in a whole strain as soon as they appear in a single individual, but not in causing segregation of inferior types for the purpose of rejecting some of the progeny.

In recent breeding of Telemark cattle, WRIEDT (1925) has shown that a certain type of malformations, conditioned by a combination of recessive lethal factors, are frequently segregated if the blood of a definite bull appears in their paternal and maternal line of ancestry. According to WRIGHT'S and TUFF'S views of this question, I presume that the Telemark breed would be a good example of one that, on account of previously practised in-breeding, should have been culled to avoid the risk of continued in-breeding. In my opinion, the appearance of the above-mentioned calves proves that culling of a strain for defects or weaknesses, by means of close in-breeding as advocated by WRIGHT, cannot be carried out in practice. The remedy in this case is evidently out-breeding, not in-breeding.

Continued brother and sister, or half-brother and sister matings, as recommended for the above purpose by SEWALL WRIGHT as well as by TUFF, will soon prove inapplicable, both for the reasons mentioned earlier and because it is not at all certain that in every generation such a superior male is segregated as to satisfy the ambition of even a very moderate breeder in his efforts for improvement. The degree of in-breeding must be judged by the method of breeding that results in improvements and uniformity, not by the system of mating that results in segregation of different types, *i.e.*, variation.

Conclusions.

In particular, I would draw attention to the fact that an overstepping of the 50 per cent. limit by means of several remote back-crosses is undoubtedly of great importance, as it probably prevents the future range of variation from becoming too great. A wide variation, from the very foundation of a breed, will result, I believe, in a subsequent segregation of many inferior types, and in a lack of constancy. With the above mentioned over-stepping of the 50 per cent. limit, however, it is highly probable that the factor complex of the prepotent common ancestor will become preponderant and will be transmitted along many lines of descent, whether the factor complex be determined by dominant or recessive factors. When, in such in-bred strains, a descendant appears (see the back-crosses with regard to the bulls Bruun Krüger and Ayr 2 in the pedigree of Aron Krüger, shown in table 4) which is as valuable as, or superior to, the progenitor, the breeder should always, particularly if the new individual is endowed with prepotency, try to fix its valuable factor complex by mating it with its children (back-cross). The reasons for this are that the

factor complex of the valuable descendant in certain cases may originate from the common progenitor in question, while in other cases, I believe, it is just as probably a result of a real and advantageous new combination of the good factors of the progenitor plus some factors which the progenitor did not possess, but which have segregated out from some other line of the pedigree (see my comments on the experiments by PUNNETT and BAILEY). Be this as it may, the above method has at all events the advantage that it can be practised, as proved several times during the history of live-stock breeding, whereas continued brother and sister, and half-brother and sister mating, practically speaking, cannot be practised in actual live stock breeding (see BAASHUUS-JESSEN 1924, p. 231). Wholesale improvement of a stock can be obtained by grading as well as by thorough in-breeding, and this must be considered an advantage. For breeders it will be natural to adopt back-crossing because, as a rule, a superior male produces more prominent daughters than it has prominent sisters. It is quite another matter, I think, that occasionally a brother and sister, both superior and of the same type, the one supplementing the other in defects and good points in one or more qualities, may be mated, provided they issue from a high degree of ancient in-breeding. Possibly a favourable combination may result from such a mating, and this new combination may then be fixed by means of subsequent back-crossing.

In-breeding, therefore, should in the first place aim at fixing a preponderance of certain unit characters, once these appear in an individual of the stock. In every breed it is undoubtedly of great importance that the individuals comprising the breed can show in their pedigrees a large percentage of in-breeding based upon the best individuals of the same line, the result of this procedure being a great uniformity of the desirable qualities.

An unquestionable advantage of close in-breeding during the foundation of a breed is, in my opinion, that by means of a moderate out-breeding which is always easier to practice than close in-breeding (see BAASHUUS-JESSEN 1924, pp. 234 and 239) the factor combinations can be varied to some extent in succeeding generations without entire loss of the type created by the original close in-breeding. According to experience in horse breeding, as attained by DE CHAPEAUROUGE, the type can to a considerable extent be maintained by means of more or less close degrees of line-breeding (see table 2), and this, in many cases, must be of great advantage, for instance, if defects should prove to segregate through close in-breeding.

In horse breeding a slight percentage of line-breeding is, as a rule, encountered. The line-breeding has, in this case, far oftener than not, been carried out unconsciously. The closer degrees of in-breeding in cattle, as mentioned previously, on the other hand, have undoubtedly been adopted quite consciously. According to HANSSON and NANNESON, close in-breeding and back-crossing have been practised in the moulding of the Swedish Ayrshire and the Swedish red and white cattle. WRIGHT (1923) states that BATES', the famous English breeder, greatest triumph was when he raised the bull Duke of Northumberland from a back-cross based on Belvidere (see p. 199). Belvidere, again, was the offspring of a brother and sister mating. Because back-crossing was not carried out with any of the parents, the conclusion appears to be justified that, in the opinion of BATES, none of them were ideal (see BAASHUUS-JESSEN 1924, p. 235, tenth line from below). The best result, evidently, was reached through that back-crossing with Belvidere from which Duke of Northumberland sprung. It is further noteworthy that Sir David also, the great progenitor of English Hereford cattle, was the offspring of a back-cross. Regarding this bull, HOUSMAN (1915) states: The influence of Sir David as a sire proved to be one of those extraordinary powers which in the histories of breeds occasionally rise up, far beyond the expectations of the breeders from whose herds they come forth. The sire of Sir David, however, does not appear to have been so closely in-bred as the sire of Comet (see BAASHUUS-JESSEN 1924, p. 233) and the sire of the Duke of Northumberland. I am inclined to believe that the well-known pattern of the Hereford cattle, which is probably one of the most constant colours known, owes its existence to ancient and close in-breeding. The factors conditioning this characteristic pattern with its many different white markings were most probably fixed casually together with the factor complex which determines the good qualities of the breed as beef cattle. FRANCIS PITT states that deviations from the characteristic pattern still occasionally occur in certain families, but also that many families breed true to it, never throwing off either dark or white variations. The fact that a whole breed in which a whole series of different, but quite constant, white markings prevail* can present a more uniform appearance of colours than that attained by WRIGHT in his laboratory experiments with guinea pigs, a material much better suited to experimental work than cattle, is suggestive of the error of his theory of automatic fixation through in-breeding by continued brother and sister matings. If this is so, the consequence would be that this method of calculation is also incorrect.

In ponies, what particularly determines their small size is undoubtedly a recessive factor complex. In-breeding, therefore, has been practised to a great extent within these breeds in order to keep the size of the animals below a certain limit. The following statements in the joint publication by BLEW, DIXON, FLEMING, and SHAW (1894) are evidently in strong support of the views which I am advocating. The very history of the most famous varieties, be they Dartmoor or Exmoor, New Forest or any other, confirms the accuracy of the statement,† and it usually occurs that a change of blood at once has the result of raising the height and increasing the substance of a strain, and continues to do so until by systematic 'sibbing' the effect of the new blood has worn itself out in this respect. Considerable differences of opinion exist

*As an example it may be mentioned that, according to FRANCIS PITT, among all types of white markings occurring in the breed, only the white face appears to be transmitted dominantly to uniformly red and black cows of other breeds. Another complex of qualities, also determined amongst other things by dominantly inherited factors, is the pattern of the white English park cattle which has been in-bred for centuries. By crossing, this breed transmits its type of colour with great constancy.

†The statement referred to is that in-breeding has to be practised in order to maintain smallness of ponies.

as to how these in-breeding operations should be conducted, but, speaking generally, it is more advisable to breed father to daughter and mother to son than to adopt the cross of brother and sister‡. In the comments on Sir George, the hackney pony stallion, it is stated : " The female offspring were in due time mated with their sire and threw foals which showed Hackney characteristics in far more marked degree than did their dams."

The point of in-breeding in live stock consists, in my opinion, in the accumulation of a certain quality complex by means of back-crossing. The method of calculation, described in Section I., furnishes a numerical expression of such accumulation. Several of the old creative breeders in England kept their methods a close secret. In other cases, fortunately, the method of procedure is known. I believe, however, that the views which I have advocated in this article coincide in the main with the old English breeders' conception of the question of in-breeding, and that their method is well worth testing in our days.

III. Lines of Research.

Watson (1924) states on in-breeding and out-breeding : " There are few questions on which the ideas of practical men differ more widely. Many dairy Shorthorn men studiously avoid in-breeding. Black-faced sheep men generally do the same. Some breeders regard it as objectionable as a rule, but practise it on occasion. Clydesdale men as a body are rather strong believers in line breeding—a kind of compromise between the two possible extremes. A learned German, who has studied the question as applied to our English thoroughbreds, concludes that the best average results in the breeding of racecourse winners have been obtained from mating animals that were related in the degree of second-cousinship, rather wide-line breeding. Aberdeen Angus men often in-breed quite closely, and do not object upon occasion to mate a bull with his own progeny. Again, many good Border Leicesters have been produced from half-brother—half-sister matings and others as close. And so one might go on multiplying illustrations of almost every conceivable gradation of practice. It, therefore, cannot be said that stock-breeders as a body have been able to formulate any general advice that would be good under all circumstances.

This statement proves that scientific researches are evidently much wanted in live stock breeding. It is possible that there is some under-lying reason why breeders of animals of various species and breeds have endeavoured to maintain a certain balance between percentages of in-breeding and of out-breeding in order to keep up a certain standard of qualities determined by multiple factors. But it is also possible that the breeders' aversion to in-breeding in many cases is due to superstition. Appel (1923) says : " I am not wrong in saying that we cannot go further without in-breeding . . . I think we have too many years considered in-breeding not to be good." Not only in Denmark, Mr. Appel's native country, but also in other countries, in-breeding has come to be regarded as something like a kind of trespassing on the fields of nature, which the breeders fear. If the saying : " No search, spooks ; search, no spooks," is applicable anywhere, it is without doubt in the domain of in-breeding.

In live stock breeding, the problems most urgently requiring investigation appear to be :

First, to ascertain which characteristics are determined by ordinary dominant and recessive factors, which by being heterozygous are unfixable, and which are determined by sex.

Secondly, to ascertain which useful or detrimental qualities are presumably determined by multiple factor complexes fixed through in-breeding, and further the percentages of in-breeding in the animals subjected to such experiments.

It is beyond doubt that close in-breeding can lead to fixation of detrimental qualities, presumably determined by multiple factors. On the other hand, it is also unquestionable that, as proved by the examples of close in-breeding quoted in my articles, this danger has been exaggerated, a danger which in many cases can be prevented by means of out-breeding.

‡It cannot be correct to practise this method of mating unless the sire be prepotent (see Baashuus-Jessen 1924, p. 235).

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(Continued at foot of second column next page)

The Veterinary Record.

20th March, 1926.

MENDELISM AND THE PROBLEMS OF IN-BREEDING.

It is difficult to decide whether the manifest antagonism of the ardent sociologist, secular and clerical, towards the question of the mating of nearly-related individuals has been based upon the actual experiences of breeders of domesticated animals, or whether the attitude of the breeder in this matter is, in the main, an emotional response to the authoritative dictum of the theorist in human biology that incest is an abomination, an outrage against all decency, and therefore to be everywhere condemned. It is undoubtedly true that in the days when the techniques of experimentation were less refined than they are to-day and when the scientific attitude of mind was less widespread, those who, for emotional reasons, held that in-breeding was deleterious had no great difficulty in adducing *data* that verified their contention. To-day, however, it is indeed difficult to avoid the conclusion, based on facts that anyone can verify for himself that, although in many instances the practice of in-breeding has led to disaster, yet this very method, in the hands of skilled breeders, has been the tool with which all that is held to be worthy in livestock has been fashioned. It can be stated with confidence that it was the over-riding of this prejudice against the mating of closely-related individuals, in the persons of the makers of the modern breeds, that raised Bakewell, the Collings, and the rest head and shoulders above their fellows.

All intelligent breeders, since the days of these pioneers, have striven to repeat their spectacular and enduring successes, and have therefore been at pains to determine in what manner these were secured. They have searched the private records and the stud and herd-books, and these have yielded up the key to success. At all stages of breed-improvement, in-breeding has been practised, sometimes with success, sometimes with serious and disastrous failure. With the emergence of the science of genetics, formulation of the laws of natural inheritance became possible, and further experimentation has shown conclusively that the results which are to be expected when in-breeding is continuously practised depend upon the inherent qualities of the original stock. If in this stock there are the ingredients of undesirable characters, in-breeding will expose these and emphasise them: if there are the elements of good qualities, these will likewise become purified and concentrated. In-breeding exposes that which previously has been hidden, and emphasises that which has been expressed: it creates nothing. It is the acid test of the worthiness of a stock. If in a stock there have been indications of infertility, diminution of maternal instinct, loss of vigour and such like, then in-breeding may be expected to emphasise these. If in the recent history of a stock there is nothing but that which is satisfactory then through in-breeding alone can these qualities be fixed.

A difficulty that has ever faced the breeder is that of estimating the degree of in-breeding that is involved in any particular mating. An early concept of inheritance was that of a "blood" contribution from each parent, and this yielded the Galtonian law of ancestral inheritance, according to which each parent contributed one-half of the make-up of the offspring, each grandparent one-quarter, and so on. But the study of the individual through Mendelian experimentation has caused a revision of ideas. The geneticist holds that sustained in-breeding leads to an increase in the numbers of factors present in the duplex state and genetical measures of in-breeding are measures of this homozygosity. In his article on the consequences of Mendelism on the problems of in-breeding in livestock, which appears in this number, Baashuus-Jessen presents a method of easy application which exhibits close affinities with the Galtonian law, and provides interesting interpretations of breeding practices based on the more modern conception of the genetics of the breeds.

(*Continued from previous page.*)

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XUM

REVIEW.

The Register of Veterinary Surgeons.

The 1926 edition of the Register has just been published and members will be receiving their copies on payment of the annual fee.

We notice a few improvements to which it may be interesting to draw attention. The calendar, which the Registrar has made into a kind of Pantheon recording the names of notable disciples of Chiron who, not only in this country, but all over the world, have added something to the edifice of veterinary science, now contains among other new entries the following, which it will be seen are worthy of record :—

July 14th, 1925.—Opening of Research Institute in Animal Pathology, Camden Town, by H.R.H. The Duke of Connaught.

August 19th, 1925.—Foundation Stone of Field Laboratories, Institute of Animal Pathology, Cambridge, laid by the President, R.C.V.S. (Mr. J. Clarkson).

October 19th, 1925.—Opening of completed new building of Royal (Dick) Veterinary College, Edinburgh, by Secretary for Scotland.

A new list has been added after the list of Honorary Associates, containing the names of the seven senior members of the profession, all of whom qualified at least sixty-five years ago. We think this a very happy thought, and we hope that our venerable seniors will take it as a mark of honour and respect. The names of the *septem viri* are :—

	Graduated.
Griffith Evans	May 24th, 1855.
John Branford White ...	April 30th, 1856.
John Roberts Hill ...	April 28th, 1859.
A. H. Santy	April 28th, 1859.
Mark Tailby	May 2nd, 1860.
T. B. Fordham	May 3rd, 1860.
Col. W. B. Walters, C.B.	May 4th, 1860.

A change has been made in the lists of Honours and Prizes in Appendix II., p. 324. The honours are now placed in order of importance, beginning with the Steel Memorial Medals. Another valuable addition we welcome is that under the heading of each Class of Honours, a short note is given stating the purpose of the Prize. We quote that prefixed to the list of the Steel Memorial Medallists :—

> "To perpetuate the memory of an earnest worker, so that his example may incite others, and to benefit the profession by encouraging and rewarding merit."

In Appendix VI., which formerly contained reprints and extracts from a few Acts of Parliament and Statutory Orders, is now given a list of important Acts and Orders of interest to the profession. These can be obtained from H.M. Stationery Office, Kingsway, W.C., or through any bookseller.

For the rest, the Register has of course been brought up to date, and contains much information useful to members.

We note that the Register now contains 3,507 names, as compared with 3,499 last year, while the list of "Existing Practitioners" in Register III. has been reduced from 74 to 69.

A list is given at p. 274 of the names of 34 members whose addresses are unknown to the Registrar, and who are liable to have their names removed under Sect. 5 (4) of the Act if a correct address is not supplied before the next Register is issued. The Registrar will welcome the assistance of members in obtaining the addresses required.

ABTRACTS.

The Development of *ONCHOCERCA VOLVULUS* in *SIMULIUM DAMNOSUM*.

Professor D. B. Blacklock contributes a valuable research on this important parasite of man in the tropics to the *Annals of Tropical Medicine and Parasitology*, Vol. xx., No. 1, February, 1926. In an article of some forty pages, with numerous illustrations, he describes his experimental and field work. The first portion of the paper deals with observations on human onchocerciasis, then comes an account of the dissection of large numbers of wild *Simulium*; this is followed by descriptions of the various stages of the worm; in the subcutaneous nodules in the egg, in the fluid near nodules, in the skin and in the gut of *Simulium*. The last section of the work is devoted to the developmental forms of the worm found in the thorax and head of wild flies and in those kept alive after feeding on infected skin. The author summarises his work in the following terms :—

1. *Onchocerca volvulus* infection is common in the Konno district of the Protectorate of Sierra Leone; larvæ of this parasite were found in the skin of 45 per cent. of persons examined systematically.

2. A definite relationship between diseases of the skin or diseases of the eye and the infection with *O. volvulus*, as judged by the larvæ in the skin, could not be established.

3. *Simulium damnosum* is very prevalent in the hill country, which is covered with bush and grass, and has numerous streams and rivers; the lesion inflicted on the skin by this species in biting is such as would dislodge the larvæ of *O. volvulus* in the skin.

4. Dissection of wild insects showed—(*a*) In 780 dissections of the gut an infection of 2·6 per cent., with larvæ morphologically identical with those of *O. volvulus*; (*b*) in 1,320 dissections of the thorax, a larval infection of over 1 per cent.

5. By allowing wild flies to feed on restricted and heavily-infected areas of skin, the gut infection was raised to 80 per cent. in one experiment and the thorax infection to nearly 82 per cent. in another experiment; the developing forms of *O. volvulus* were found in the thorax after the infecting feed up to the seventh, eight and tenth days, after which no insect survived.

It will be seen that this work goes a long way towards solving the life history of this species. There are

several allied worms which are found in domesticated herbivora in different parts of the world and many attempts have been made to worm out the problem of "worm nests" in beef. The subject is, therefore, of interest to the veterinarian. The following are some of the most important species of *Onchocerca* found in equines and bovines. *O. reticulata*, Diesing, 1841, in the tendons and ligaments of the horse's limbs, below the knee and hock; *O. cervicalis*, Railliet and Henry, 1909, in the ligamentum nuchæ of the horse, where it may give rise to poll-evil and fistulous withers; *O. armillata*, Railliet and Henry, 1909; *O. bovis*, Piettre, 1912; *O. gutturosa*, Neumann, 1910; *O. indica*, Sweet, 1915, and *O. gibsoni*, Cleland and Johnson, 1910, occur in bovines, chiefly in hot countries. *O. gibsoni* is the cause of worm nests in beef.

A. W. N. P.

Enzootic Encephalitis of Cattle.

At the end of 1924 the authors made an investigation in the North of France into a disease of cattle the symptoms of which do not appear to correspond with any known cattle affection. The disease is characterised by severe nervous manifestations and is almost invariably fatal. The onset of symptoms is sudden. The subject shows more or less abundant salivation, trismus, diminution or complete loss of vision and chronic contractions of certain groups of muscles. At an early stage, signs of cerebral excitation appear, and during it a position is often assumed with the posterior limbs crossed under the abdomen and the forelegs stiffly extended. During these crises, there is an increase in the general sensibility, resulting in hyper-excitability accompanied by some degree of exophthalmos, hurried respirations and the production of an abundant sweat. Muscular contractions may cause a lateral deviation of the head on the neck much resembling the position observed in milk fever. Following a period of excitement, the animal becomes semi-comatose. As a result of a paralysis of the optic nerve, the vision is seriously affected in almost every case, the outward sign being an exaggerated pupillary dilatation. The digestive tract is also affected, as shown by a cessation of rumination accompanied by an extremely obstinate constipation. The temperature is rarely elevated.

On *post-mortem* examination, the only lesions noted, apart from intestinal stasis, are confined to the brain. The condition in acute cases is essentially an encephalitis affecting chiefly the cerebral cortex. The cells of the deeper layers are surrounded by masses of round cells. The chromophilic granules disappear from the cell bodies and the nuclei, which become eccentric, are feebly stained. The capillaries are much congested and many erythrocytes appear in the perivascular tissue. In more chronic cases the whole of the grey matter is invaded by round cells and the ganglia cells show evidence of atrophy. This condition was first thought to be due to a form of poisoning from the ingestion of plants containing oil of mustard, but the experimenters were unable to set up the disease by feeding the suspected plants. They consider that, since the lesions show such a marked similarity to those seen in encephalitis lethargica in man, the condition is probably caused by a virus. Nevertheless, attempts at transmitting the disease to healthy cattle and to rabbits were unsuccessful.

The condition might be confused with rabies, milk fever or botulism. Concerning the last mentioned, it is noted that paralysis of the 5th, 9th, 10th, 11th and 12th pairs of cranial nerves with the resulting derangement of prehension, mastication and deglutition is not seen in this disease.

With regard to treatment, encouraging results have been obtained with hexamethylene tetramine; 15 gms., inoculated subcutaneously twice daily, resulted in the recovery of thirteen cases amongst nineteen, whereas the mortality in the untreated was 100 per cent. Even in those treated animals which succumbed, there was evidence that the course of the disease was temporarily checked.

(L'Encephalite Enzootique des Bovides. L. Marchand, R. Moussu et A. Bonnetat. *Rec. de Med. Vet.*, 1925, July, Vol. 101, No. 13, p. 385.)

R. E. G.

The Organism of Contagious Agalaxia in the Sheep and the Goat.

Since the observation of Celli and Blasi, confirmed by Carré, that the virus of agalaxia will pass through certain filters, many unsuccessful attempts have been made in the past to cultivate the causal organism. Bridré and Donatien have been successful in obtaining *in vitro* a culture of this virus which they describe as "filterable but not invisible."

In its morphology and almost all its cultural and biological characters, the organism is identical with that of pleuro-pneumonia in cattle. It can be isolated with ease from infective milk, synovial fluid and lymphatic glands, either by direct culture or after filtration through a Chamberlain L lb. Martin broth containing 10 per cent. to 20 per cent. serum is a favourable medium. Visible growth is seen after incubation at 37° C. for three to four days. On serum agar, the colonies exactly resemble those of pleuro-pneumonia. At a temperature of 37° C., in the absence of oxygen, cultures will remain viable for at least 22 months and will retain their virulence for 15 months.

The subcutaneous inoculation of 0.5 c.c. of a broth culture into a sheep or goat leads to the formation of a local swelling which disappears towards the 15th day. Then, after a period of from one to four weeks, lesions appear in other positions—arthritis, keratitis, etc. The inoculation of the lactating female is certain to result in infection, the organism showing a marked predilection for the active mammary gland.

A protective serum can be obtained by the intravenous inoculation of the goat, the sheep and the horse with increasing doses of culture. 20 c.c. of a

serum so prepared will protect a lactating goat against the subcutaneous inoculation of 0.5 c.c. of culture.

Attempts at producing an active immunity have met with little success. Cultures of the virus which have been modified by storage or by continuous sub-cultivation, or have been killed by heat or formol are incapable of inducing an immunity. Similarly, sensitised virus and sero-vaccination are useless in the goat, but afford some protection in sheep and lambs.

The authors consider that, since lactating sheep and goats are, in practice, the only animals which it is necessary to immunise against agalaxia, the present methods are not capable of bringing about a decisive result. Attention must be drawn to the direct immunisation of the mammary gland.

(Le Microbe de L'Agalaxia Contagieuse du Mouton at de la Chevre. J. BRIDRÉ et A. DONATIEN. *Ann. de L' Inst. Pasteur*, 1925, December, Vol. 39, No. 12, p. 925.)

R. E. G.

NEW MILK REGULATIONS.

"A set of important regulations for securing cleanliness in the handling of milk is contained in the Milk and Diaries Order, 1926 (Stationery Office, 3d. net), which has been drafted by the Minister of Health and is due to come into operation on July 1st.

"Provision is made for the registration of all dairies and dairymen, and the duty of inspecting cattle in dairies is laid on every county and borough council. The order insists that cowsheds shall be properly lighted and ventilated, that they shall be kept 'sweet and clean,' and that they shall be whitewashed in May and October of every year. It forbids the depositing of milk in any room used as a kitchen, scullery, living room or sleeping room, or in any place where it is likely to become infected, and requires that every person dealing with milk shall keep his clothing and person in a cleanly condition.

"The dairyman is required to report to the medical officer of health any person in his household or the household of his employees who is suffering from an infectious disease, and medical officers are given authority, when the supply or part of the supply of a dairy is suspected of being infected, to prohibit the sale of such milk for limited periods. Cattle in dairies must be kept clean and the udders must be cleansed regularly before milking is begun. Churns and receptacles other than bottles, delivered to a dairyman, must be thoroughly cleansed by him before he returns them.

"The penalties for offences, as fixed by the Milk and Dairies (Consolidation) Act, 1915, are fines not exceeding £5 for the first offence; not exceeding £50 for subsequent offences; and not exceeding 40s. per day in the case of a continuing offence.

"The Public Health (Imported Milk) Regulations, 1926 (Stationery Office, 1d. net), which it is proposed shall come into force on January 1st, 1927, lay on sanitary authorities the duty of inspecting imported milk, and forbid any person to import milk unless he is registered by the sanitary authority into whose district the milk is imported. If milk fails to reach a certain standard of cleanliness the importer may be removed from the register, but appeal from the decision of the sanitary authority is provided. These regulations do not apply to condensed or dried milk."—*The Times*.

DIVISIONAL REPORTS

Eastern Counties' Division.

FIFTIETH ANNUAL MEETING AT NORWICH.

The Jubilee Meeting of this Division, which was held at Norwich, on Friday, February 26th, though it failed to attract the attendance which might have been anticipated upon such an occasion, nevertheless provided the members who supported the officers with a very pleasant afternoon.

The President (Colonel W. A. Wood) occupied the Chair, and there were also present Messrs. Vincent Boyle, M. Bray, H. Buckingham, J. Buckingham, G. T. Matthews, H. P. Standley, H. P. Standley, junr., W. L. Stewart, J. F. Thurston, J. Truman, P. R. Turner and W. H. Wortley, together with the Hon. Secretary, Mr. W. Shipley.

At the outset, the President reminded the members that that meeting marked the Jubilee of their Society. He was sure that they were all proud of this long record and he trusted that the organisation would increase in usefulness and influence.

The minutes of the previous Annual General Meeting, having been published in the *Veterinary Record*, were taken as read and were confirmed and signed.

New Members.—The President informed the meeting that during the year six new members had joined the Division and he had pleasure in submitting for election that day the names of Messrs. W. J. Leyshon and H. R. Allen, both of whom are working with Professor Buxton in the Institute of Animal Pathology at Cambridge.

The HON SECRETARY seconded the election of these gentlemen, and the proposition was carried unanimously.

A nomination was made of a registered practitioner and, after some discussion, it was agreed to defer consideration of this matter to the next meeting. It was further decided to secure from the "National" a ruling as to whether or not registered practitioners not being members of the R.C.V.S., are eligible for membership of the N.V.M.A., and therefore of its Divisions.

Accounts.—The PRESIDENT: You have before you the Balance Sheet in respect of the year 1925. You will see from it that the receipts for the year were £5 15s. 6d. in subscriptions. There was a balance at the end of last year of £58 3s., and our expenses have amounted to £54 odd. We now have a balance in hand of £54 11s. 9d., so that I think you will agree that the position of the Society, so far as finances are concerned, is fairly satisfactory. I use the qualifying adjective for the reason that the financial position could, and should, be considerably improved by the payment of the arrears of subscriptions due from members. There is a considerable number of these, and the amount owing under this head is about £50.

The HON. SECRETARY: There has always been a considerable difficulty in dealing with this matter

of subscription arrears. Personally, I feel strongly—and I am sure that many, if not all of you, will support me in this—that it is time that we dealt with this matter with a firm hand. May I call your attention, in this connection, to Rule I, which states: "The Entrance Fee to be 10s. 6d. for each member and an Annual Subscription of 10s. 6d., to be paid in advance, on the 1st of January in each year. Any member failing to pay his Annual Subscription in advance within three months, it shall be the duty of the Treasurer to apply for it; when, if not paid on or before the next meeting ensuing after such application, the President shall, with the consent of a majority of the members then present, deal with the case as they deem expedient." This is a matter, continued the Secretary, which has been allowed to stand over for a long time and, probably as a consequence, there is a large number of gentlemen who now take not the slightest notice of any demand for money which one may make upon them on behalf of the Association and who, moreover, never attend its meetings. Such ineffective membership is not only valueless but actually detrimental to the Association, and it is a question as to how we stand with these members, because we have been going on for so many years. The point of difficulty arises as to where we should commence in dealing with them.

Mr. H. P. STANDLEY proposed "That any member of the Association in arrears with his subscriptions for two years be informed that in the event of non-payment he renders himself liable to the deletion of his name from the membership roll."

The proposition, which was seconded by the HON. SECRETARY, was unanimously agreed upon.

The accounts, which had been approved by the auditors, were passed as correct.

CORRESPONDENCE.

1. Apologies for absence were announced from the following: Messrs. J. Barr (Acle), J. T. Bosworth (Cambridge), T. W. Browning (Ipswich), A. P. Burgon (Haverhill), E. A. Burgon (Haverhill), Professor J. B. Buxton (Cambridge), Messrs. A. F. Castle (Ipswich), R. E. Glover (Cambridge), F. L. Gooch (Stamford Baron), Major F. T. G. Hobday (London), Messrs. V. Pride-Jones (Newmarket), G. W. Kerry (Newmarket), E. B. Reynolds (Newmarket), H. L. Roberts (Ipswich), W. Turtill (Wickham Market), and H. E. Wilkinson (Martham).

2. From the President of the N.V.M.A., inviting the Division to contribute the cost (£2) of a link, to be inscribed with the name of the Division, in the Presidential Chain of Office of the Association.

3. From the Secretary of the N.V.M.A., informing the Division that, with a view to increasing the utility of the organisation of the "National," an endeavour was to be made to secure the proper functioning of its Branches. The Council of the "National" invited that Division, together with the others, to co-operate in the holding of a Branch meeting in the particular area to which it belonged, and suggested that the Division might forego one of its ordinary meetings for that purpose. It was further proposed that the Presidents and Secretaries of Divisions and Branches should confer together with a view to making the necessary arrangements, and that each Division should immediately get into touch with the Secretary of its Branch in connection with this matter.

4. From the Secretary of the Royal Sanitary Institute, inviting the Division to appoint delegates to the Congress of the Institute, to be held in London, from July 5th-10th.

The PRESIDENT: Arising out of this correspondence, the first thing we have to deal with is the provision of a link in the President's Chain of Office. I think it would be a very good thing, if we consider that the financial position of the Division warrants our doing so, for us to vote the requisite amount of £2 for the payment of the link which is to bear the name of the Eastern Counties' Division.

Mr. H. BUCKINGHAM seconded the proposition, which was carried unanimously.

The PRESIDENT: I will ask you now to consider the question of our foregoing one of our meetings in favour of our participation in the Branch meeting, which is suggested in the letter from the Secretary of the "National."

The HON. SECRETARY: The greatest difficulty in getting attendance to our meetings now is that it is so difficult for members to get away, and it is very doubtful if they could find the time to devote to the attendance of a meeting held at a very much greater distance than is the case with our own gatherings. Such a Branch meeting as is proposed might be a benefit to one or two of us individually, but it is for you to decide if it would be of benefit to the Society itself.

Mr. TURNER: All of us, as members of our profession, have the opportunity of going to the Annual Conference of the "National," wherever it is held, and surely that is sufficient. I think that to foster the spirit of comradeship amongst our own members in the immediate neighbourhood is the thing we want to do, particularly because, in our immediate neighbourhood, there are matters peculiar to it which arise, and these are the things which we want to discuss. In my own case, if I want to go to Dublin, it means that I have to leave my practice for a whole week, and if we adopt this Branch meeting idea it means that there will be an additional big demand upon our time.

The PRESIDENT: I understand that, on the occasion of the next meeting of the Council of the N.V.M.A., representatives of the various Divisions of the Southern Branch will meet on the same day and discuss what is to be done, and they wish the Divisions to authorise their representatives to that meeting to say whether or not their Division is in favour of the holding of Branch meetings. If sufficient Divisions are in favour, the details will then be settled. We should endeavour to decide the point to-day for the information of our representatives.

Mr. MATTHEWS proposed: "That this Division sends representatives to the meeting to be called to consider the subject of holding Branch meetings

and that authority is given them to acquiesce in the holding of a meeting of the Southern Branch, but not at the expense of a meeting of the Division."

Mr. TURNER, who remarked that, on the occasion of the two previous meetings of the "National" the representation from that Society had been very poor, and that consequently he felt there was little likelihood of better representation being secured at a Branch meeting, moved the following amendment: "That, in view of the fact that, as the meetings at our local towns are so badly attended, we do not feel that a fair representation could be secured at a Branch meeting held at a more distant centre. This Division feels, therefore, that it cannot participate in the holding of such a Branch meeting."

Mr. H. P. STANDLEY seconded the amendment.

The HON. SECRETARY: If it is the feeling of the members of the Association that they will not be able to attend a meeting of the Southern Branch, it is, I submit, not worth the while of your representatives to attend this special meeting and promise the support of this Division for the holding of a Branch meeting. I have no objection whatever to attending the meeting, but it must be on the understanding that, if it is decided that a Branch meeting is to be held, the support of the members of this Division will be forthcoming.

The amendment was carried and, being put as a substantive resolution, received the approval of the meeting.

The PRESIDENT: I think we must now revert to this matter of the Sanitary Congress. This Congress marks the Jubilee of the Institute and I understand that it is going to be a most important Conference, particularly from a veterinary point of view. The Veterinary Inspectors' Section will be considering matters of great interest and moment to the profession and, as this Division has always been represented in the past, I think that upon this particularly important occasion we should certainly appoint delegates. As far as I understand it from Mr. Shipley, it is not going to involve any delegate in a big expense, for it would be quite in order for this Society to meet the ordinary expenses incurred by its delegates.

It was agreed that delegates be sent and that their expenses be paid.

Mr. TURNER: I have much pleasure in proposing that we send as delegates Colonel Wood and Mr. Stewart, both of Cambridge, as I am sure they both have very receptive minds and will give us a good account of the proceedings.

The delegates were appointed accordingly.

ELECTION OF OFFICERS.

The PRESIDENT: It is with very great pleasure that I submit to you the name of Mr. Turner as your President for the ensuing year. I am sure he will make a very excellent occupant of the Chair, for he always comes to our meetings and takes a keen interest in the work of the Division. I can say with confidence that you could not elect a better man. (Applause).

Mr. SHIPLEY seconded the proposition, which was carried with acclamation.

Mr. TURNER made suitable acknowledgment of the honour.

Vice-Presidents.—The HON. SECRETARY: I have taken this matter out of Colonel Wood's hands for the moment, because I wish to propose that he shall be made a Vice-President of the Society (Hear, hear). The Vice-Presidents were then appointed as follows: the retiring President, Mr. H. P. Standley and Mr. J. F. Thurston.

Committee.—The following gentlemen were elected to serve as the Committee of the Division for the ensuing year: Messrs. S. R. Beaumont, A. F. Castle, H. F. Down, G. T. Matthews, W. Turtill, W. Waters and W. Wortley.

Hon. Auditors. — Messrs. H. Buckingham and T. E. Barcham were re-elected auditors.

Hon. Secretary and Treasurer.—Colonel WOOD: I am sure you will all join me in thanking Mr. Shipley very warmly indeed for the very excellent way in which he has carried out his duties in his joint capacity of Hon. Secretary and Treasurer of the Division. No one could have devoted more whole-hearted attention to his duties, and I am sure that we cannot do better than re-elect Mr. Shipley for the ensuing year.

The HON. SECRETARY: I shall be very glad to be relieved of the responsibility of the offices which you are now honouring me by asking me to retain, and I would much rather that you should endeavour to secure somebody else to take my place.

No other name being forthcoming, the re-election of Mr. Shipley was made with acclamation.

Representatives to the Council of the N.V.M.A.—The PRESIDENT: We are entitled to two representatives as our number of members exceeds fifty, together with our Secretary as an *ex-officio* representative. We have received a letter from Mr. Roberts informing us that, owing to pressure of work, he will regretfully have to resign his position as one of our representatives. I would like to refer, at this point, to the special meeting of the Council of the "National," which was held yesterday, at which there was a great deal of discussion about the circular memorandum which had been sent by the Ministry of Agriculture to the various local authorities. Several resolutions were passed and no doubt you will get a better description of what took place in the account of the proceedings which will be published in the *Record*, than anything I can give you to-day. The sense of the meeting was that the Council were not in favour of chief constables being placed as chief veterinary inspectors. The discussion was divided into two main resolutions: the first referred to places where there already existed a veterinary staff and a chief veterinary inspector—such as the big cities of Liverpool, Manchester and Birmingham, and the second laid down a general principle for the rest of England, where perhaps the chief constable was already officiating as chief inspector. The Council did not consider that it was to the advantage of the veterinary profession as a whole, that chief constables should be chief inspectors under the Diseases of Animals Acts.

The HON. SECRETARY: Colonel Wood has been rendering excellent service to the Division by attending all the meetings of the N.V.M.A. Council that he could possibly attend—and there are very few that he has missed—and I should like to support his nomination.

This election was approved, and the new President was also appointed to serve, together with the Hon. Secretary.

The retiring PRESIDENT at this stage invited Mr. Turner to the Chair. In taking it, the latter returned thanks for the honour of his election and expressed the hope that the members would do their utmost to support him and the other officers of the Division in their endeavour to make the year upon which they were entering one of the most successful in the long annals of the "Eastern Counties."

Mr. H. P. STANDLEY: I feel that we should be very remiss if we allowed this occasion to pass without putting on record our very deep appreciation of the splendid service rendered to this Division by Colonel Wood during his term of office as our President. His task has not been an easy one, but he has fulfilled it well, and I am sure it is your wish that the best thanks of the Division be accorded him. (Hear, hear).

Mr. H. BUCKINGHAM seconded and the vote was carried with enthusiasm.

Next meeting.—The PRESIDENT: We have now to decide upon the place of our next meeting, which will be held in July, and, as your President, I should like to invite this Association to visit my native town of Bury St. Edmonds. I have there a lawn which I hope to get fit enough to allow of the playing of a bowls tournament, and it has always been my ambition to entertain the members, in playing for the cup which was given by my old friend Mr. Shipley, senr., for the purpose of raising funds on behalf of the Victoria Veterinary Benevolent Fund. We could have the business meeting and afterwards adjourn to the lawn and play for this cup. (Applause).

The HON. SECRETARY: I think this is very kind of Mr. Turner, as his first act as our President, and I beg to suggest that we accept his invitation with thanks. This was agreed.

ANY OTHER BUSINESS.

Rules.—Mr. MATTHEWS: Should I be in order in bringing up the matter of a suggested revision of the rules of this Division? Reverting for a moment to the question raised under the heading "Election of New Members," I wish to point out that Rule I. states that: "membership of this Division is open to anyone possessing a recognised diploma."

The PRESIDENT: I think the words mean Diploma of the Royal College of Veterinary Surgeons; indeed, under this cover and title (referring to the book of rules) I think you cannot interpret them as meaning otherwise.

Mr. MATTHEWS: I suggest that the words in our rule should read: "the Diploma of the Royal College of Veterinary Surgeons," and I move that Rule No. I. be amended accordingly.

Mr. STEWART seconded the proposition, which was agreed upon.

Mr. MATTHEWS: In that case, I beg to call attention to Rule 6, which states: "Any gentleman as qualified under Rule I."

Colonel WOOD: I trust I shall be in order in suggesting that a small committee be appointed to revise these rules, to bring them up to date and to report their recommendations to the next meeting.

The HON. SECRETARY seconded, and the meeting approved the proposition.

The PRESIDENT: May I call on Mr. Matthews to withdraw his resolution pending the receipt of the report of this committee?

Mr. MATTHEWS: If my seconder has no objection I shall be very glad to do so.

Mr. STEWART concurred, and the meeting then elected the following sub-committee to revise the rules: The President, ex-President, Messrs. Matthews, Standley, senr., and Reynolds, with the Hon. Secretary.

Mr. STANDLEY: It has occurred to me that we should do well to set apart a whole day, on the occasion of one of our meetings, for the performing of certain operations—of interest to us all—by our own members, such as tooth extraction, trephining, poll-evil, fistulous withers and neurectomy. Such a programme would attract a large attendance; we should have a good discussion and, I think, altogether a very useful and interesting meeting. It would draw the members, and that is a very important consideration.

The HON. SECRETARY, in seconding Mr. Standley's proposition, said that that was a suggestion which had been made many times, but had only once been adopted. On that occasion he (Mr. Shipley) went to very considerable expense in getting subjects to Yarmouth, while Mr. Reynolds went there to operate, and an attendance of six members was their reward. He thought, however, that they should try again, as this was the only way in which to succeed, but that it should be left over to the autumn meeting, as the meeting at Bury was to be in the nature of a social gathering combined with business.

The PRESIDENT supported the suggestion of an operative programme, but said that the difficulty was to get suitable cases for operation when they wanted them.

Colonel WOOD: If the Bury meeting is to be held on the third week in July, it will be ten days or so after the Sanitary Congress, therefore our delegates might make their report on that occasion.

It was eventually decided that the July meeting programme should comprise a business meeting, the presentation of the report of the Royal Sanitary Institute Congress delegates, and the bowls competition for the Shipley Cup; the autumn meeting to be devoted to operations and discussions thereupon.

Donations.—The meeting voted the sum of £5 5s. towards the Victoria Veterinary Benevolent Fund, and £3 3s. as an honorarium to Mr. Shipley's Clerk, who

was also accorded a vote of thanks for services rendered in connection with the meetings of the Division.

Considerable discussion was provoked by a proposition by Mr. THURSTON, that a donation be given to the Royal Agricultural Benevolent Society. The proposer suggested the sum of £5 5s., and expressed the opinion that, in view of the depressed state of agriculture, such a donation would be a graceful and timely acknowledgment of the intimate and cordial relations which existed between that industry and the veterinary profession.

The PRESIDENT, the HON. SECRETARY, and other members opposed the proposition, on the ground that if the Division had any money to spare it might be better employed in supporting the profession's own Benevolent Fund or furthering some purpose more closely allied to the profession.

Mr. STANDLEY supported the proposition which, however, was heavily defeated on a vote.

Pathological specimen.—Mr. J. BUCKINGHAM: I have brought here a small tumour which I removed from the rectum of a five-year-old hunter. It protruded when the animal was ridden and the next day it would go back again. It is about the size of a walnut and it had a distinct neck. I ligatured it in three places on the first day—in the middle and at each side of the neck—and on the fourth day I put a ligature right round and it came off cleanly and quite easily.

No further morbid specimens being forthcoming, the President declared the meeting closed.

W. SHIPLEY,
Hon. Secretary.

North of Scotland Division.

MR. J. ANDERSON'S "GENERAL REMARKS ON DYSTOKIA."

(*Continued from Page* 259.)

FŒTAL DYSTOKIA. (1) *Lateral deviation of the head.*—Here we have one or both limbs presented and the head turned to either the right or left. Extreme lateral deviation of the head must be looked upon as a most serious presentation in both the mare and the cow, and more serious when the fœtus is dead. In the cow, extreme lateral deviation of the head may be rectified because of the shorter neck of the calf which makes it possible for the obstetrist to reach the head and insert a hook in the orbit when, by repelling the limbs and exerting traction on the head, the normal position may be attained. In some cases in the cow, however, one finds it impossible to reach the head and in such a presentation I consider it advisable to resort to embryotomy at once. Up to the the present, I have found it necessary in such cases to remove one or both fore limbs before effecting delivery—a trying and none too pleasant an operation. To-day, I am bringing before your notice an instrument which was very highly spoken of at Cambridge and which, if it does half of what is claimed for it, will be a great boon to the obstetrist in such cases. You will see it is just a few feet of Bowden wire and the idea is that it be used as a saw. In a case of deviation of the head, it will not be necessary to amputate limbs; one simply puts the saw over the neck, crosses the ends and gets someone to saw through the neck. Mr. Trevor Spencer, who speaks highly of this instrument, says he can cut through a calf's neck in five minutes. I have not had an opportunity of testing it yet, but am hopeful that it will save a lot of the hard work one has to go through in these cases. In the mare, in such cases, one may adopt forced extraction. I have never resorted to it and shall be less inclined to do so if this saw is a success. The larger the mare, the more successful is forced extraction likely to be, but it should not, I think, be employed as routine practice.

(2) *Breech Presentation.*—The thigh and croup presentation, with which we frequently meet in the mare and cow, is one that gives the obstetrist a lot of trouble and in the mare is a most serious presentation. The flexed hocks come against the brim of the pelvis and the expulsive efforts of the dam cause the hocks to become extended, until finally the entire limbs are pushed well forward under the body of the fœtus. The operator may attempt to adjust the limbs. The fœtus should be repelled and an effort made to reach the fetlock with a cord; if successful in getting a cord on to the fetlock, then it may be possible to rectify the position, care being taken to guard the foot—otherwise there is great risk of rupturing the womb. In some cases it is impossible to reach the fetlock and where this is so, division of the Tendo Achilles greatly helps, or division of the Tendo Achilles and forced extraction may effect a delivery. Again I would point out that this is a presentation in which the saw will be of great assistance. This presentation in the cow is also a serious one, but in this case the obstetrist can derive great assistance from raising the patient's hind-quarters with the pulley. This puts the body in a state of ventral flexion; the spinal column is flexed, the vaginal passages tend to assume a vertical position and to undergo shortening, while the force of the pains, when occurring, is greatly lessened. It is very important to observe that this state of ventral flexion can only be obtained by having the pulley well forward. If the pulley is fixed directly above the hind-quarters of the cow, all parts on put are the stretch, and the vaginal passage is lengthened rather than shortened, its calibre lessened and the cow's position rendered much more uncomfortable.

Discussion.

Mr. CRABB: I have listened to Mr. Anderson's address with the greatest of pleasure and interest. His paper brings two or three cases to mind.

I had a case of torsion of the uterus in which I could find no opening of the cervix. The cow would not lie down, but I put her down and had her rolled. I had my hand in the vagina during the operation and was almost drowned by the sudden outrush of the confined fluids. The calf followed and all went well.

In another case, the calf had the feel of a seal. On *post-mortem*, the calf was a real monstrosity,

nearly three feet in diameter and with a head and neck almost exactly like a seal. The next case was one of those with all the internal organs of the calf presented. After pulling those away, I found that the calf was doubled backwards on itself. I managed to calve the cow, but she did not live. I found rupture of the uterus on *post-mortem*.

Mr. DRENNAN: Mr. Anderson has given us a most excellent paper, one which will cause us to think for many a day to come. I have learned, from experience, that it is folly to force parturition cases if nature will do the work herself. In cases of rigidity or contraction of the os, it is wise to give the cow plenty of time—even days if necessary, and you will find that nearly every case will calve spontaneously

In cases of scirrhous os, I have had no success in operating with the knife.

In breech presentation cases, I find there is often great difficulty in getting up the hind legs without rupturing the uterus with the hocks of the calf. It is always well to get the hock in the hollow of the hand and guide it so that it does not injure the viscus.

With reference to the use of the Bowden wire, exhibited by Mr. Anderson—would there not be a danger of injuring the vagina of the cow?

Mr. RICE: I add my thanks to Mr. Anderson. In a case of torsion of the uterus in a large Friesian cow, I had her cast and rolled but was unable to deliver her even then. On *post-mortem*, I found that the calf was dropsical.

In cases of cows going down with milk fever before calving, I think it is best to get them stunned and remove the calf alive.

Has anyone had experience of cysts of the vagina, met with in calving? Is it wise to incise them and allow the fluids to escape? Hitherto, I have not done so, and find that they render little obstruction to the act of calving.

Mr. DRENNAN: On New Year's morning, I was called to a cow which had been calving since the day before. On examination I found that the fœtus had a head like a pig and little or no neck. On attempting to deliver the calf, all the legs came away until there was nothing left but the body, which I could not remove. I ordered her to be taken to the slaughterhouse to be killed. The owner could not get a float that day, therefore, the cow was left until next day, when I got a message telling me that the cow had calved herself.

Mr. CLERK: I would like to congratulate Mr. Anderson on his paper. He deserves our thanks. Mr. Anderson deprecated forced traction in cases of head back. I have practiced that method for some time with marked success and found that the mares lived. Before beginning, I always give the patient two ounces of chloral.

Many years ago I had a case of calving in which the cow had been in labour all the morning, with the assistance of all the handy men in the locality. The head and both fore legs were presented, but still the calf would not come. With persistence, we got the fore end of the calf away, it had broken over the kidneys. We then found that the hind legs had penetrated the uterus and had got under the brim of the pelvis, and thus prevented complete delivery.

Mr. BEATTIE: I am sorry I had an accident to my car on my way in, therefore I was unable to appear in time to hear the bulk of the paper.

Dystokia is a most interesting subject. Patience and tact are the two most necessary adjuncts. In bad cases I believe in giving a pound of Epsom salts and two ounces of chloral before commencing operations.

I have rather an unusual case just now. A steam wagon with a load of calver cows was upset on the ice. Two of the cows were badly damaged. I managed to calve one of them and found that her uterus was ruptured. Notwithstanding, I think she will get on all right. The other cow is not yet calved, but as she is standing with a dropped abdomen, I suspect she also is suffering from rupture.

Mr. LYON: I have never had a case of torsion of the uterus. How do you rope the cow for rolling?

Mr. BROWN: I do not do very much in the way of parturitions now-a-days, but at one time I was very fond of them. Parturition is one of the subjects which you cannot learn out of a book. It is only by experience, patience and tact that one can become an expert obstetrician. The greatest bugbear of the veterinary surgeon is interference before he is called in.

It is, I think, wise in bad cases to give chloral or chloroform before commencing; it quietens the patient, especially mares—and relieves one of the tremendous straining which is such a hindrance to correcting malpositions.

Always repel the fœtus before you try to do anything else. I found long ago that the best repeller was a sensible man with a long arm. He and the operator stand back to back, the one using his left arm, the other his right. The operator can then instruct him what to do and how to do it. I have found this better than any mechanical repeller ever made.

In cases where there has been previous interference, and the vagina and fœtus are dry, I believe in using plenty of soapy water or even good colza oil.

I remember a case of torsion of the uterus which I had one very stormy day. We took the cow out in the snow and rolled her downhill ever so far with no result. Finally, I asked my assistants to send her over with a good jerk. This was effectual. The moral is, do not be too gentle in these cases.

I have been thinking over Mr. Drennan's query about the Bowden wire injuring the vagina of the cow. Mr. Hepburn was showing me his Danish instrument, which is on the same lines except that the wire is led through two metal tubes, so as to prevent injury to the parent. I would suggest the barrels of an old double-barrelled gun if such can be had as a substitute.

Mr. HOWIE: We have had a most excellent paper on dystokia from Mr. Anderson. He deserves our best thanks for bringing it forward, because it is a subject which everybody can talk about. I myself could talk on it for a week, as I think that in forty years I have met almost every form of abnormality n the mother and fœtus. I would like to support Mr. Brown in his idea of using a human repeller

in difficult cases. I have done so for many years and can vouch for the assistance it has been to me. For one thing, there is one other person to whom you can talk and who has some idea of your difficulties.

I was in practice for twelve years before meeting with a case of torsion of the uterus and that year I had three—all successful. I have, however, had one or two cases where I failed. I found, on *post-mortem* in these cases, that the twist had been in existence so long that adhesions had formed and prevented the rolling from undoing the twist.

Since being at Cambridge, I have had a Bowden wire prepared and carry it in my pocket to my cases, but so far have had no necessity for using it. I am looking forward to great benefit from it, in such cases as those mentioned by Mr. Crabb, where the fœtus is folded back on itself like the leaves of a book. If one could cut the calf in two across the back it could be delivered in two halves without risk of damaging the womb or vagina.

Mr. ANDERSON, in reply, said: In the first place, let me thank you for the good discussion to which my humble effort has given rise.

In reply to Mr. Crabb about the fibrous bands in the vagina, I cut them through. Harvey referred to it in his paper, relating two cases in which he cut in four places, one lived and one died. The great danger is rupture of the uterus.

The Bulldog variety of calf is found mostly in Kerry cows or their offspring.

I agree with Mr. Drennan about rigidity of the cervix. It is best to have patience and adopt the waiting policy. The cervix should not be operated on as it almost invariably relaxes spontaneously.

I also agree with him in connection with breech presentations, that the injury to the uterus is usually caused by the point of the hock. Elevation of the hind-quarters of the cow is of the greatest assistance in these cases. The pulleys should be placed well forward so that the abdominal muscles may be well relaxed.

I was surprised that no mention was made of anæsthetics. I think there are certain cases in which they would greatly assist but, on the other hand, you miss the expulsive efforts of the cow or mare.

In reply to Mr. Rice, I cannot tell the cause of cysts in the vagina, but they cause no trouble and it would do no harm to puncture them.

Regarding forced extraction of the fœtus, there are cases, in which the mother has plenty of pelvic capacity, where it might be safely adopted. In cases where the head is lying in the flank of the fœtus, the head would get buried in the soft tissues and thus do no harm. In cases of breech presentation, I have had no success with this method and am anxious to try the Bowden wire.

In reply to Mr. Lyon, I usually apply the ordinary side lines for casting and fixing a cow for rolling in torsion of the uterus. In bad weather it is not nice to go outside for this purpose, but one can generally get a straw shed or barn to take the animal into.

(Continued at foot of next column.)

NOTES AND NEWS.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events.

March 24th.—Meeting of the Comparative Medicine Section of the Royal Society of Medicine, at 1 Wimpole Street, W.
„ 25th.—Meeting of the Southern Counties Division at 10 Red Lion Square, W.C.
„ 31st.—Garnett Memorial Fund Closing Days.
April 1st.—R.C.V.S. Annual Fee of £1 1s. 0d. due.
„ 7th.—N.V.M.A. Council and Committee Meetings.
„ 8th.—R.C.V.S. Committee Meeting.
„ 9th.—R.C.V.S. Committee Meeting; Council Meeting 2 p.m.; Garnett Memorial Fund Committee Meeting.
May 7th.—Last day for nominations for election to Council, R.C.V.S.
„ 21st.—R.C.V.S. Annual Report and Voting Papers issued.
„ 26th.—Entries for D.V.S.M. Examination due.
„ 27th.—Last day for return of R.C.V.S. Voting Papers.
June 3rd.—R.C.V.S. Annual General Meeting.
„ 21st—26th.—D.V.S.M. Examination.
„ 30th.—R.C.V.S. Annual Dinner, Hotel Victoria, London, 7-30.
July 1st.—R.C.V.S. Committee Meetings.
„ 2nd.—R.C.V.S. Committee and Council Meetings.
„ 9th.—R.C.V.S. Written Examinations.
„ 13th.—R.C.V.S. Oral Examinations commence in London.

July 27th-30th.—N.V.M.A. Congress at Dublin.

MIDLOTHIAN C.C. AND VETERINARY GRANTS.

At a meeting of Midlothian County Council, held in the County Buildings, Edinburgh, on March 10th, appeals for assistance from the Royal (Dick) Veterinary College, Edinburgh, and from the Animal Diseases Research Association were read.

Mr. T. W. H. M'Dougal said he was opposed to the giving of a grant. This was not a suitable time, and if they gave a grant it would open the door to other organisations and these would be asking for grants.

Sir Robert Usher said that the demands for veterinary science were increasing to-day. Veterinary science was always progressing, and people must keep up to date.

The only thing out of which they could give a contribution, however, was the Equivalent Fund. When the time came round next year, he concluded, they might seriously consider whether or not they should give a grant

(Continued from previous column.)

Remember, however, when you roll her up against the wall, that you must reverse the cow, so as to maintain the rolling in the proper direction.

Mr. Wallace promised to supply a paper or subject for discussion at the next meeting.

A hearty vote of thanks was accorded to Mr. Anderson for his conduct in the Chair and also for his excellent address. GEORGE HOWIE,

Hon. Secretary.

to the Royal (Dick) Veterinary College and the Animal Diseases Research Association.

The matter was then dropped.—*Edinburgh Evening Dispatch.*

Foot-and-Mouth Disease.

Since the issue of the February *Journal of the Ministry of Agriculture*, the following outbreaks of foot-and-mouth disease have been confirmed, in Essex, 1; Lancashire, 6; Leicester, 8; Lincoln (Lindsey), 2; Norfolk, 2; Nottingham, 1; Stafford, 3; Warwick, 4; Yorks. E.R., 3; Yorks N.R., 5; and Yorks W.R., 2.

New centres have been brought to light at Buttercrambe Yorks. E.R.; Lincoln (Lindsey); Packington (Leicesters.); Newton-in-Cartmel (Lancs.); Birmingham; Leicester; Great Yarmouth; Stoke-on-Trent; Nottingham and Sheffield.

Up to and including 25th February the number of outbreaks since 1st January, 1926, was 40, involving 11 counties.

Personal.

Appointments.—Subject to confirmation by the City Council, the Health Committee have appointed Mr. S. G. Abbott, of Clydebank, to the post of Assistant Veterinary Inspector for the City of Sheffield.

* * * *

The Joint Committee of representatives of the burghs in the Stewartry of Kirkcudbright and other local authorities have appointed Mr. James Waddell, M.R.C.V.S., Castle-Douglas, veterinary inspector for the county under the Milk and Dairies Act. Mr. Waddell has been in practice in Castle-Douglas for over fifteen years, and during the war was second in command of one of the largest veterinary hospitals in France.

Obituary.

The late Captain A. E. Willett.

"Residents of Staines and district, learned this week with regret," says the *Sunday Herald*, of March 12th, of the death on Sunday, after a long illness, of Captain Albert Ernest Willett, M.R.C.V.S., R.A.V.C. (T.F.), of Shapcott, Cherry Orchard, Staines.

"The deceased gentleman was aged 53, and was a member of the firm of Willett and Sons, of Staines, the well-known veterinary surgeons. He was the third son of the late Mr. Albert Willett, and Mrs. Willett, of Gresham Villa, Staines, and was born in the town. He received his education, first at Col. Lane's School, Staines, and later at King's College, London, from which he entered the Royal Veterinary College, Edinburgh, as a student.

"After qualifying, he became partner in the extensive practice carried on for so many years by his father and brother, joining his brother on his father's retirement.

"He was very highly esteemed throughout the district both for his professional and personal qualities. He served in the Royal Army Veterinary Corps during the Great War from 1915 to 1918, both in Salonica and France. During his service in Salonica, he was in command of a veterinary hospital, and was mentioned in General Milne's despatches. While in France he was attached to a Mobile Section. It was during his war service that he contracted the illness which had more or less incapacitated him ever since, and has now resulted in his untimely death. He had remained on the active list and was attached to the 1st London Brigade.

"Deceased was a prominent Freemason and was a Past Master of the Staines Lodge, a P.Z. of the London Stone Chapter, and held Provincial Grand Rank, both in the craft and Royal Arch.

"He was also a past President of the Central Veterinary Medical Society, and until lately an active member of the Council of the National Veterinary Medical Association of Great Britain, and other Societies.

"He leaves a widow and four young children to mourn their loss."

Amongst those present at the funeral, in addition to Mr. J. Willett, M.R.C.V.S. (brother), were the following members of the profession:—Major-General Sir John Moore, K.C.M.G., C.B., Major E. Middleton Perry, C.B.E., Major G. W. Dunkin, M.R.C.V.S., D.V.H., Mr. F. T. Trewin, M.R.C.V.S. (president of the Royal Counties Veterinary Medical Association), and representatives from the National Veterinary Medical Association and the Central Veterinary Society.

Members of the staff of Messrs. Willett and Sons were also present.

Among the wreaths, were tributes from the President and Fellows of the Central Veterinary Society and the President and Members of the Royal Counties Veterinary Medical Association.

The late Mr. E. V. Stokes.

A correspondent forwards us the following extract from a paper published at Port Elizabeth, South Africa:—

"It is with deep regret that we have to record the death of Mr. Ernest Vernon Stokes, the well-known local veterinary surgeon, who passed away at his residence, Fairview House, Princes Street, last evening. He had not been in good health for some considerable time past, but several days ago he suffered a recurrence of illness from an old trouble created in the exercise of his profession, and despite loving care and skilled medical attention, the end came.

"The late Mr. Stokes, who was considered an expert in his profession, came to this country as a member of the Army Veterinary Dept. during the Boer War. When peace was declared he was one of the officers at the Potchefstroom Experimental Farm. Over twenty years ago he came to Port Elizabeth, and opened the practice of his profession, in which he enjoyed the confidence of the people of Port Elizabeth, also of the farmers in the Eastern Province.

"During the Great War, Mr. Stokes went through, as veterinary officer, the campaign in German West Africa. Subsequently he was chosen to accompany the expedition to Ovamboland. He had many interesting experiences during his war career. Quiet and reserved, he loved his home life, and took little part in public affairs.

"Sincere sympathy will be expressed with Mrs. Stokes Miss Stokes (daughter), and Mr. Jack Stokes (son), in their sad bereavement. It will be remembered that Mr. Jack Stokes was seriously wounded in France during the Great War."

Mr. Chamberlain, Minister of Health, asked by Mr. Riley (Dewsbury), if he could give the number of local authorities which had already put into operation the regulations or by-laws with regard to the slaughtering of animals for food; and if he could state whether the application of the by-laws was increasing, said:—I presume the hon. member refers to the model by-law which provides for the use of a mechanical stunning instrument before slaughter. This by-law has been adopted in whole or in part, by 190 local authorities. Fifty-seven of these were in the last twelve months.

Frank Garnett Memorial Fund.

Twenty-seventh List of Subscriptions.

	£	s.	d.
Amount brought forward from twenty-sixth list	477	13	0
S. H. Nye	1	1	0
	£478	14	0

Army Veterinary Service.

London Gazette—War Office—Territorial Army.

March 16th.—Major P. M. Edgar, O.B.E., having attained the age limit is retired and retains his rank with permission to wear the prescribed uniform (March 17th).

CORRESPONDENCE.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

The Future of the Profession.

TO THE EDITOR OF THE VETERINARY RECORD.

Sir,—Evidence is rapidly accumulating that the doom of the veterinary profession, as an entity, is near at hand. The causes are many. One of them is the general apathy of the members towards the welfare of the whole. This has always existed and, though it is perhaps not so marked now as it was a few years ago, the improvement has come too late to save the profession.

Other factors outside the profession lie in the methods used by the authorities to counter the effects of animal diseases and to uphold the public health. There is in nearly every county now a sort of veterinary service which renders assistance to the farmer. In the towns, meat inspection is no more our province now than it was in the past. Lay meat inspectors, with quite a good standard of efficiency, are being appointed everywhere.

Another source of danger is the spread of agricultural colleges and departments. These institutes certainly trespass upon veterinary preserves, often aided by veterinary surgeons acting as teachers.

To sum up, the animal population of the rural areas seems to be pretty well looked after by the State. In the towns, the horses have departed before the invasion of the mechanically-propelled vehicle. The dogs and cats are left—but even in their case, some of those, that should be patients of the veterinary practitioner, are taken by their owners to the free clinics provided for the very poor.

Lastly, we have been recommended to take up poultry diseases. This does not seem a very paying proposition since, as cattle, sheep and pigs are freely destroyed to prevent the spread of disease, how much more reasonable it must be to slaughter such cheap animals as fowls to bring about a similar result.

What can be done to save the situation? The answer is that the profession must become part and parcel of the great medical world. The doctors, once convinced that veterinary work is essential to the well-being of the community and that it is also necessary to the whole medical art, will fight its battles with all the power at their command. Though, perhaps, at first the veterinary surgeons would be in a subordinate position, yet, in time, they would reach those places which they deserve.—Yours truly,

BERNARD GORTON, South Woodford.

12*th March*, 1926.

The Editor acknowledges the receipt of the following:—

Report of a meeting of the Scottish Metropolitan Division, from Mr. W. C. Miller, Hon. Secretary.

Report of a meeting of the West of Scotland Division, from Mr. G. W. Weir, Hon. Secretary.

Communications from Messrs. D. J. Anthony, W. E. Armstrong, H. W. Dawes, T. Grahame, Major-General Sir John Moore, Messrs. J. K. Shaw, R. S. Smyth and Lt.-Col. T. D. Young.

National Veterinary Medical Association of Great Britain and Ireland.

EDITORIAL OFFICE: 10 Gray's Inn Square, London W.C.1.

All communications relative to the literary side of the Veterinary Record must be addressed to the Assistant Editor, "Veterinary Record," 10 Gray's Inn Square, W.C.1

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